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GROWER AND CONSUMER INTERESTS IN THE POTATO PROBLEM

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Any plan that is developed for and in cooperation with potato growers would have as its chief objective the elimination of the wide fluctuations in the production and prices of potatoes, and the movement of the level of prices toward parity. This is in line with the parity principle and the declared policy of Congress stated in the Agricultural Adjustment Act supplemented with related legislation which includes the Potato Act.

This declaration of policy as stated in the Agricultural Adjustment Act is in part as follows:

"Through the exercise of the powers conferred upon the Secretary of Agriculture under this title, to establish and maintain such balance between the production and consumption of agricultural commodities, and such marketing conditions therefor, as will reestablish prices to farmers at a level that will give agricultural commodities a purchasing power with respect to articles that farmers buy, equivalent to the purchasing power of agricultural commodities in the base period. The base period in the case of potatoes shall be the postwar period, August 1919—July 1929.

"To protect the interest of the consumer by approaching the level of prices which it is declared to be the policy of Congress to establish by gradual correction of the current level at as rapid a rate as the Secretary of Agriculture deems to be in the public interest and feasible in view of the current consumptive demand in domestic and foreign markets."

Address delivered at Boston, Massachusetts, Monday, November 4, 1935.

Wide yearly fluctuations in production and prices are wasteful and costly both to farmers and to consumers. Perhaps in no other nationwide industry are these wastes and costs greater than in the potato industry. Over a period of years the production of potatoes ranges from less than 300 million bushels to more than 400 million bushels. Two crops of 350 million bushels each will return more to potato growers and cost consumers considerably less than will one crop of 300 million bushels and another of 400 million bushels. Potato growers get less when returns are averaged for large and small crops than for crops of medium size. Consumers pay more on the average for large and small crops than for crops of medium size partly because of waste in marketing.

When the production of potatoes greatly exceeds the level of consumption, potatoes not only waste in the fields and in storage on the farm, but they also waste after they move into the hands of jobbers, wholesalers and retailers. This waste, oftentimes unavoidable, makes necessary a wider margin of profit which is eventually paid by consumers.

The conclusions stated above were reached after a study of potato production, growers' prices and the prices paid by consumers for potatoes in recent years. In one comparison we took the period from 1923 to 1928 and compared two years of normal production with the average of a high year and a low year. The cost to the consumer during the average of the small crop year of 1925 and the large crop year of 1928 was $2.11 a bushel. During the 1923-1928 period the two years in which production was nearest the level of consumption were 1923 and 1927. The cost to the consumer during these two years of medium production averaged $1.91 a bushel.

Thus, the consumers paid during this period 20 cents more a bushel on the average in the years of extremely high and low production than the average in the years of moderate production.

The average yearly return to the producers for potatoes sold in the seasons of normal production was $269,059,000. The average for the extremely small and large crop years of 1925 and 1928 was $247,700,000. This difference is due largely to the fact that more potatoes were sold and fewer wasted during the seasons of normal production. The amount received by growers a bushel averaged approximately the same in the years of low and high production as during the years of medium production.

In this connection, the average quantity of potatoes unsold from the 1925 and 1928 crops was 15,500,000 bushels larger annually than the average for the two years of more nearly normal size crops. Much

of this 15,500,000 bushels increase was wasted, the greatest loss being in 1928 when production reached the record high total of 425,600,000 bushels.

Marketing and transportation costs, however, averaged considerably higher for the low and high crop years of 1925 and 1928 than for the seasons of medium production. During the latter, transportation and marketing costs averaged 89 cents per bushel as compared with $1.08 a bushel average for the low crop year of 1925 and the high crop year of 1928.

Next, we took the longer period from 1920 to 1934 and made comparisons of averages for the three years of highest production and the three years of lowest production, with three seasons of normal production in this longer period.

The three largest crops of this longer period were grown in 1922, 1928, and 1934; the three smallest in 1925, 1926, and 1933, and the years in which production most nearly approached normal were 1923, 1927, and 1932.

The average return a bushel to the grower for the years of high and low production of this longer period from 1920 to 1934 was 84 cents, as compared with 83 cents in the years 1923, 1927, and 1932. As was the case in the shorter period, however, the total return to growers averaged higher in the seasons of medium harvests. The producers received about $203,000,000 annually in the moderate production years of 1923, 1927, and 1932. The average yearly return in the high and low years was $200,500,000.

The study of the longer period also showed that the consumers fared considerably better in the seasons when the crop was neither particularly high nor exceptionally low than in the years of extreme fluctuation.

The consumer paid an average of $1.72 a bushel in the highest and lowest years, and an average of $1.64 in the years of medium-sized crops.

As in the shorter period previously analyzed, the transportation and marketing costs were higher when production was comparatively unstable. It cost an average of $209,800,000 annually to get the crop to the consumer during the high and low years. The average cost was $196,500,000 when production was normal.

The price of potatoes is very sensitive to production. Over-production quickly forces the price down. Under-production, which follows over-production, sends the price up to high levels.

The grower bears the brunt of low prices during the years of heavy production and unfortunately the years of high prices fail to recompense

him. A high price in many instances means that the ordinary commercial grower has been forced by lack of funds to cut his production to the point where his income is reduced below the total necessary to compensate for the low price seasons.

Comparison 1923-1928 *period*

	Average of 2 Years Nearest Normal Production, 1923-1928 Period	Average of 2 Years, One Highest and One Lowest Production 1923-1928 Period
Production, bushels	367,600,000	361,600,000
Marketings, bushels	262,600,000	241,100,000
Returns to growers for potatoes sold	$269,050,000	$248,700,000
Transportation and marketing costs	$233,500,000	$260.000,000
Costs to consumers	$502,550,000	$508,000,000
Growers' return per bushel sold	$1.02	$1.03
Transportation and marketing costs (per bushel)	$ .89	$1.08
Consumers' cost per bushel	$1.91	$2.11

Comparison 1920-1934 *period*

	Average of 3 Years Nearest Normal Production, 1920-1934 Period	Average of 3 Years Highest and 3 Years Lowest Production 1920-1934 Period
Production, bushels	364,300,000	361,700,000
Marketings, bushels	244,200,000	238,700,000
Returns to growers for potatoes sold	$203,300,000	$200,500,000
Transportation and marketing costs	$196 500,000	$209,800,000
Costs to consumers	$399,800,000	$410,300,000
Growers' return per bushel sold	$ .83	$ .84
Transportation and marketing costs (per bushel sold)	$ .81	$ .88
Consumers' cost per bushel	$1.64	$1.72

The differences in the two comparisons may be explained in part by the changes in the general level of all prices. Taking this factor into account, we arrive at the general conclusion that potato growers averaged slightly more annually from crops near normal size than they averaged from the average of extremely large and small crops. We also find that transportation and marketing costs are annually, from $10,000,000 to $15,000,000 less, for crops of medium size. Although consumers pay less for crops of medium size, they get a larger

quantity of potatoes and a better quality of potatoes than they do in the years of extreme fluctuation.

Another question of interest to both growers and consumers is the level at which prices will be maintained over a period of years. In this connection, it should be kept in mind that the parity price or the fair exchange value for potatoes is that price at which a given quantity of potatoes would purchase as much of the commodities bought by potato growers as the same quantity of potatoes would have purchased during the base period 1919 to 1929. In effect, it is the average of the 1919 to 1929 period adjusted to the change in the prices of commodities bought. The prices of commodities bought by farmers during the past year averaged 78.75 per cent of the prices prevailing for these commodities during the base period 1919-1929. The prices received by growers of all states for potatoes sold from August 1919 to July 1929 averaged $1.138 per bushel. By taking 78.75 per cent of $1.138 we get a present parity price for the country as a whole of 89.6 cents per bushel.

The parity price in the surplus states is lower than it is in the deficit states. The present parity price in any state or section may be calculated by taking the average price received by growers from August 1919 to July 1929 in that state or area and multiplying this average by the current index of the commodities bought (78.75). The average price received by growers during the base period by states and the parity for the last season are as follows:

State	Average Price Received by Growers, August 1919 to July 1929 Cents per Bushel	Parity Price for 1934 Crop Cents per Bushel
Surplus Late Potato States:		
Maine	99.1	78.0
New York	117.0	92.1
Pennsylvania	120.5	94.9
Three Eastern	110.6	87.1
Michigan	92.1	72.5
Wisconsin	89.7	70.6
Minnesota	87.0	68.5
North Dakota	87.0	68.5
South Dakota	101.4	79.8
Five Central	89.3	70.3
Nebraska	106.7	84.0
Montana	109.2	86.0
Idaho	91.3	71.9
Wyoming	119.5	94.1

Colorado	93.7	73.8
Utah	108.0	85.0
Nevada	112.0	88.2
Washington	101.7	80.1
Oregon	108.2	85.2
California	141.9	111.7
Ten Western	106.3	83.7
Total 18 Surplus States	100.2	78.9
Other Late Potato States:		
New Hampshire	141.3	111.3
Vermont	130.3	102.6
Massachusetts	154.7	121.8
Rhode Island	163.3	128.6
Connecticut	159.3	125.4
Five New England	145.6	114.7
West Virginia	144.3	113.6
Ohio	140.5	110.6
Indiana	137.9	108.4
Illinois	169.0	133.1
Iowa	125.7	99.0
Five Central	140.5	110.6
New Mexico	178.4	140.5
Arizona	197.9	155.8
Two Southwestern	186.9	147.2
Total 12 Other States	141.6	111.5
30 Late States	105.7	83.2
Intermediate Potato States:		
New Jersey	133.7	105.3
Delaware	120.7	95.0
Maryland	129.1	101.7
Virginia	125.4	98.8
Kentucky	162.0	127.6
Missouri	151.1	119.0
Kansas	156.0	122.1
Seven Intermediate	135.4	106.6
37 Late and Intermediate	109.3	86.1
Early Potato States:		
North Carolina	138.2	108.8
South Carolina	156.7	123.4
Georgia	204.0	160.5
Florida	227.0	178.8
Tennessee	161.2	126.9
Alabama	205.1	161.5
Mississippi	205.4	161.8
Arkansas	183.0	144.1
Louisiana	188.3	148.3
Oklahoma	184.1	145.0
Texas	222.8	175.4
11 Early States	179.3	141.2
Total United States	113.8	89.6

Prices in the commercial areas of the surplus states are lower than those for the remainder of these states. Prices on designated markets during the base period, parity prices for the 1934 season, and prices received by growers since 1931 are as follows:

Market	Average Price Received by Growers U. S. No. 1 Aug. 1919 to July 1929	Parity Price 1934 Crop U. S. No. 1	Prices Received by Growers Cents per Bushel				
			Prior to 10/1/35	1934 crop	1933 crop	1932 crop	1931 crop
	Cts. per Bu.	Cts. per Bu.					
Presque Isle, Maine	85.4	67.3	19	14	72	22	19
Waupaca, Wisconsin	74.2	58.4	27	22	57	18	22
Benton Harbor, Mich.	74.9	59.0	33	20	60	19	19
Idaho Falls, Idaho	78.7	62.0	25	32	46	16	26

From the above it will be noted that during three of the last four years and prior to October 1 this year, growers in the principal commercial areas received between one-fourth and one-half of one cent a pound for potatoes. Generally stated, these prices were between one-fourth and one-half of parity, and in most areas they were less than the out-of-pocket cost to farmers. To repeat, this is the fourth year of the last five when a situation of this kind has prevailed. Prices advanced during the month of October, however, and at present are around three-fourths of parity.

They are now near the level we had in mind when we worked out a program in an attempt to raise the return to growers on their 1935 crop. In drafting the 1935 program, we felt that any increase in the return from this year's crop would not only bring some immediate relief to growers, but would be a step toward the ultimate objective of getting rid of the peaks and valleys in the potato cycle.

As you will recall, the program for 1935 provides for payments to growers who elect to divert a portion of the 1935 crop to by-product uses such as alcohol, starch, flour and feed. In addition, the growers would receive the returns paid by by-product processors. Marketing agreements under which shipments of off-grade potatoes would be regulated also have been proposed by growers and handlers in some areas. In this way surplus potatoes would be kept off the market so that improved prices would result for the remainder of the crop.

As I have said, prices in most commercial areas have already reached the levels contemplated when the program for 1935 was drafted. Consequently, it may be necessary to divert only a few potatoes. In fact, the general price improvement and the effect of recent freezes make it possible that diversion will not be resorted to at all. But we intend to keep the offer open as a safeguard against price declines.

This advance from recent low levels makes a lot of difference to potato growers. It will mean that some of them can begin to buy potato diggers, other machinery, paint, roofing, and pay debts. It will mean increased purchasing power to more than a quarter of a million farm families depending upon potatoes as the principal source of income. For the most part they have been unable to buy anything but absolute necessities and many of them have been below a reasonable standard of living during the past five years.

As you know, the national tax-exempt sales allotment of potatoes has been fixed at 226,600,000 bushels for the year beginning December 1, 1935. With consumption near present levels, between 64 and 65 per cent of the potato crop has been sold during past years when the production was of average size. Consequently sales of 226,600,000 bushels would mean a crop between 350 and 355 million bushels. We feel that sales of 226,600,000 bushels will be accompanied by total production which will furnish enough potatoes for every one and at the same time result in a reasonable return to the growers.

It must be kept in mind, however, that while national sales have averaged between 64 and 65 per cent under such conditions, the sales percentage in the various states have varied widely. That accounts for what might seem at first glance discrepancies in sales apportionments among the states. For example, one state sold an average of 80 per cent of its production during years of normal production and consumption. Other states sold less than 10 per cent. In effect, this means that if a normal situation prevails, total production in some states would be ten times the sales allotment and all the crop would be consumed without any taxes being paid, while in other states total production would be only 25 per cent in excess of the sales allotment.

It is, of course, possible that our national sales allotment will be found too high or too low because of unusual and unforeseen conditions. The Act, however, gives us a bit of leeway which provides a measure of protection for both growers and consumers, an adjustment not exceeding five per cent upward or downward being possible for the country as a whole.

Prices to growers in the commercial areas during the past month have advanced from an average of one-third of a cent a pound, which

was the average price received for three of the last four crops and for this year's crop prior to October 1, to three-fourths of a cent a pound. An important question is how this increase in growers' prices will affect consumers' costs.

When the growers were receiving one-third of a cent a pound for potatoes, consumers were paying, on the average, about a cent and a half a pound. For a time at least, prices to consumers probably will be advanced by the full amount of the advance to growers, and possibly slightly more. This will mean an increase in retail prices from approximately a cent and a half to an average price of about two cents a pound. When we consider the prices paid by consumers for potatoes during previous years—and I do not believe many consumers feel that growers have received too much over a period of years in the past—two cents a pound does not seem high.

The program for the 1935 crop is a part of a general plan that covers a period of years and is designed, as I have said, to stabilize both production and prices to the benefit of both grower and consumer. Parity prices to potato growers, along with uniform production and prices from year to year and with other commodity prices at present levels, would mean retail prices for potatoes approximately one-third below those which prevailed from 1919 to 1929.

Past experience indicates that if prices should be stabilized at a point near parity, the reduction in marketing and transportation costs probably would result in an average saving to consumers of between 10 and 15 per cent, as compared with past years when production and prices have fluctuated widely. The remainder of the difference would be connected with the present lower level of the prices of other commodities.

In addition, the elimination of the wide fluctuations in potato production and prices would mean also the elimination of most of the small and inferior potatoes that are sent to market in times of short crops and high prices, and would prevent the sheer waste and spoilage of millions of bushels of potatoes which occurs in every year of heavy production and low prices.

A larger quantity of potatoes for funds expended and potatoes better in quality and higher in food value would be available to consumers if crops of average size should displace the surpluses and shortages of the past.

I believe that most consumers who have thought this whole problem through and who—as most of them are—inclined to be fair and follow a policy of "live and let live" will favor a program of the type we have in mind.

POTATO VIROUS DISEASES IN 1934

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This review summarizes very briefly about one hundred and twenty papers, abstracts, and reports that have come to the writer's attention since his preparation of a review for 1933 (35).

Three general books (41, 102, 106) contain much about potato viroses. Two bibliographies (7, 83) contain many references to potato viroses and promise supplements in the near future. There are more general articles or parts of general articles than usual on potato viroses (26, 29, 30, 40, 47, 63, 72, 77, 109, 116).

Experimental transmission and field observation have added to our knowledge of what insects must be controlled (12, 14, 28, 34, 59, 62, 65, 71, 75 p. 273, 80, 104). For yellow dwarf this includes a leafhopper (12, 37a, 80) and an aphid (37a, 59). In addition to some of these references on insects, others on natural dissemination show that it varies with the region and, in the same region, with seasonal and field conditions (12, 17, 19 p. 81-82, 32, 33, 54, 65, 71, 73, 75 p. 363, 80, 99, 100, 114).

Tuber indexing based on the chemical composition and physiology of the tubers (5, 6, 10, 31, 84, 90 p. 11-13, 91, 97, 119) is not considered reliable by all workers and has not become so useful as tuber indexing based on the plants grown in the greenhouse or early in the field (19 p. 81-82, 36, 53, 90 p. 45-47, 118).

Control to some extent is feasible by means of certification, selection, isolation, roguing, and other seed-plot methods (4, 20, 23, 34, 53, 54, 71, 75 p. 57-58 and p. 363, 77, 99, 111, 113, 117) but complete effectiveness requires protection by insect-proof cages or greenhouses (34, 71, 90 p. 45-47, 94). Control is complicated by the existence of some viroses that are masked under certain conditions (54, 94, 100, 111, 113, 117).

Knowledge is increasing about the relative resistance of different varieties, both old and new, to various viroses (8, 15, 39, 66, 71, 81, 90 p. 45-47, 100, 107, 115, 118).

The dominance of the ecological viewpoint as to the cause of degeneration ("Abbau") in Germany (31, 49, 55a, 56, 57, 60, 61, 82, 85, 86) is being corrected by German work on the virous theory (56, 62, 63, 64, 65, 82, 106 p. 408 footnote 4) and is being explained by evidence

elsewhere of the effect of environment upon virous diseases (17, 80, 114). The effects of latitude and altitude upon degeneration and virous diseases vary (13, 21, 22, 23, 24, 32, 33, 88).

Scientific information is increasing about the effects of degeneration ("Abbau") and virous diseases upon the physiology of the plant (31, 46, 67, 74, 75 p. 50, 85, 91, 104, 119), about the "properties" of viruses (1, 2, 9, 16, 70, 103, 108), about their serology (42, 43, 44), and about their effects upon plant structure (48, 74, 93, 104).

In addition to general information upon yield in relation to viroses (4, 19 p. 84-85, 20, 23, 84, 88, 90 p. 11-13 and p. 45-47), including those masked (17, 94), measured yields are discussed (17, 21, 22, 24, 32, 33, 62, 99, 114, 115).

New data are available on masked mosaic and streak diseases (1, 2, 9, 14, 16, 17, 24, 43, 44, 50, 55, 64, 66, 70, 71, 75 p. 50 and p. 136, 90 p. 45-47, 94, 100, 104, 108, 111, 112, 113) as distinguished from the general group of the mosaic-streak-crinkle type in an apparent state (4, 13, 14, 15, 16, 17, 18 p. 36, 21, 24, 42, 43, 44, 53, 54, 55, 62, 64, 66, 67, 71, 74, 75 p. 136, 81, 82, 84, 88, 90 p. 11-13 and p. 45-47, 92, 99, 100, 104, 107, 111, 113, 118). Tomato spotted wilt has been transmitted to potato (37). "Bigarrure" is a new disease (115).

New data are available on leafroll (3, 4, 8, 13, 14, 17, 21, 24, 27, 28, 36, 46, 49, 62, 64, 65, 67, 71, 74, 75 p. 50, 76, 80, 81, 82, 84, 88, 90 p. 11-13, 91, 96, 99, 100, 107, 112, 114, 119) and on yellow dwarf (12, 19 p. 84-85, 37a, 59, 73, 77, 80). Aster yellows has been transmitted to potato (101).

New data are available on spindle tuber (99, 107) and giant hill (48, 99). Some potato virous inoculations on tomato gave fern leaf (89, p. 242).

The evidence now seems to be conclusive that psyllid yellows is due to the insect directly and not to a virus (18 p. 37 and p. 42, 27, 52, 58, 68, 69, 72 p. 82-87, 78, 79, 95).

Some but not all forms of internal spotting or browning of tubers are due to virous diseases (11, 25, 38, 45, 51, 87, 98, 105, 110, 112).

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THE GEOGRAPHY OF SCAB IN THE UNITED STATES

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A study of the distribution of scab in the United States will assist in correlating the more formal studies of this most serious disease of the potato crop.

In Northeastern United States, the area of our heaviest population and greatest opportunities for the production and sale of potatoes and of milk, the farmers in general have to choose between the two lines of production. They cannot, as would be most desirable, combine these two lines of farming because the potatoes will be scabby if the pH values are above 5.2. Legumes, on the other hand, require a high pH. Moreover, cabbage, lima beans, snap beans, spinach and beets do not thrive at 5.2 which is most favorable for potatoes. This impossibility of combining the two lines of production otherwise most economic, is the largest single argument for potato breeding. One factor in this region is that many of the subsoils are more open and friable than they should be for the best results. In a few places they are calcareous.

In the area from the Carolinas to Long Island, there is much sand, and good aeration. The use of sulphate of ammonia is almost universal, and pH values are maintained around 5.0. In some places, clay subsoils help. In the Norfolk region, seed treatment is regarded as superfluous. In large areas, the potatoes are beautifully smooth and clean.

The largest area of muck in the United States is the 3,000,000 acres in the Everglades of Florida. Some of this muck north of Lake Okeechobee is underlaid with sand and is mildly acid; but most of the Everglades are underlaid with amorphous lime rock. On one large property southwest of the lake, where commercial potato production has been attempted on a large scale, it has been found impossible to proceed because scab damage has been too severe. This territory is not alone highly alkaline but is liable to extreme drought during tuber-making time.

In Wisconsin and Michigan, scab and sandy soils usually are associated. While pH ranges are not so high as farther west, a few run above 6.0. In some cases the pH values are low enough to moderate scab while in others the soil is sufficiently acid to prevent its appearance. In many places, clay loams and clay subsoils are a complete protection. Dippenaar, working in Wisconsin, found that drought makes acid formation slow and less dependable. To be of any value, the sulphate of ammonia in this territory must be applied early.

In the dry land regions of the semi-arid West, where growers specialize in seed potatoes, combinations of dry subsoil, high aeration, high pH values, high soil temperatures and susceptible varieties, result in considerable scab. Under these conditions no real remedy has been found for the disease.

On one series of lake beds in Cerro Gordo County, Iowa, there is a rather loose peaty muck of some depth over good subsoils. The aver-

age of 12 pH determinations from as many furrow slice samples ran 6.96. The scab record is very bad. We see only one reason why these beds should not grow clean Cobblers, at least in the moist seasons, and that is that these areas receive heavy applications of an 0-20-20 fertilizer in alternate years for onions. This may result in a concentration of superphosphate. We have an idea that the maintenance of a high ground water level under this group of lands would prevent scab losses.

On peaty muck, in Worth County, Iowa, 14 samples averaged a pH of 7.6. This muck is underlaid at a depth from approximately 3 to 5 feet with sandy marl and marly clay. It has been cropped steadily to potatoes for nearly six years. In the hot dry seasons of 1931 and 1934 scab was severe. In 1932 and 1933, seasons with abundant moisture until after the tubers had set, the potatoes were clean. Clean potatoes were expected in 1935, with the abundant moisture of the early season, but extreme drought came before the tubers were past infection size.

At one shore line of the above bed, Cobblers scabbed 100 per cent each year. In this area there are two feet of "mineral" muck, with a pH of 7.8; a foot of clay, with pH of 7.75; and 3 feet or more of brown sand with clay streaks, with a pH of 8.51. Out farther into the old lake, there is a secondary shore line with a pH of 7.33, and beyond in the level black muck one sample at 4 inches gave a pH of 5.87. Even in 1933, there was some scab at the secondary shore line, and on the secondary beach, but none out on the main body of muck.

In Hancock County, Iowa, there is an old black muck bed with pH values of about 7.6. The subsoils to 8 feet under this piece are substantial clay and gritty clay. No scabby tubers are produced even in the dry years. The shape of the tubers is unusually good, but the yields are not so good as on some lighter lands. Here evidently, low aeration, plenty of moisture and coolness, far outweigh the high pH. Even with heavily scabbed seed we have been able to produce but a trace of scab in this area. In this same County we have a peat bed with potato rows a half mile in length. At the north end, the potatoes produced are clean, but scab gradually increases toward the south end where it is severe. Here, there is white sand at a depth of four feet. This sand is farther down at the center of the field, and the borings show only clay subsoils at the north end, where the Cobblers produced are clean.

One of the largest lake beds of the state has about 200 of its acres lying in a block between the turnpike and the western shore line. The drainage ditch parallels the road and is deep. Here the brown peat is 6 feet thick. This thickness tapers to nothing at the far shore line.

Cobblers, planted at right angles to the deep ditch are first very scabby, then less and finally free from the disease. The grower now plants Russet Burbanks first, then Rurals, and finally where the clay comes closer, the Cobblers.

In Winnebago County, Iowa, is located a half-section where a subsoil of white sand so favors scab that potato growing is impracticable. Were it practicable to keep the sand filled with water this half-section probably would be excellent potato land.

In Cerro Gordo County, Iowa, one of the very best of growers grew potatoes for a long period on a flat sandy loam with a subsoil of gravel mixed with clay streaks at a depth of approximately 3 feet. In spite of the best of seed treatments and the substitution of Rurals for early potatoes, there was much trouble with scab. On the slopes of clay hills nearby there was no trouble.

In the Laughlin lake bed in Wright County, Iowa, five successive crops of potatoes have been grown, and although they have had bad scab years, all these crops have been clean. The average pH value of 14 samples in this area in 1932 was 6.6. This bed has one to three feet of peaty muck over gritty blue clay. No scab has appeared except in a burned spot. The pH of a burned earth sample taken in November 1933, was 9.10 and of nearby muck, both at tuber depth, 6.37. There is less air in the burned spots and the tuber beds are nearer the cool damp subsoils. In general, scab infection is approximately the same in the burned spots and in near-by muck. Samples from the Senick place at Crystal Lake, Iowa, where the areas were burned, showed a pH of 7.90, and for the near-by muck 6.93; from the Klein place, burned 7.76 and near-by muck 6.20. The Gealow bed at Belmond, Iowa, continuously cropped to potatoes for nine years, has not produced scab except on the shore lines. We have found nothing but muck and black clay, to a depth of 8 feet. One furrow slice sample of muck on this farm where the potatoes have been clean had a pH of 6.25; and a sample from the shore line showed a pH of 7.57. Evidently factors other than pH values are important in determining the presence or absence of scab in all these places.

On our prairie soils in Iowa, with deep strong clay subsoils, and also on our clay hills there is no scab. On our deeply loose soils, and even on the heavy ones, that are shallow over gravel, we have trouble in plenty.

On the medium soils and over our medium subsoils everywhere, we have no scab in the damp seasons and only slight infection in the dry seasons.

On rich land over good clay subsoils, even without seed disinfec-

tion, we may and often do grow potatoes every year for many years, and get fine yields and no scab.

With continuous cropping on the medium soils with medium subsoils like gravelly clay, scab finally becomes so severe that the potato cannot be grown.

Long rotations are apparently necessary for best results and after a reduction of the population this is beneficial for potatoes for only one year. Scab damage for the second crop is maximum for that land. We seem to have no lands in Iowa that are free from the organism.

On the Great Hollandale, Minnesota marsh, scab is a serious matter on some farms and not a factor elsewhere. One soil sample from a farm that never has had scab trouble, showed a pH of 7.84 and one sample from a field where scab was severe, 6.52. The soil texture and the subsoils, in these instances, were apparently more important than the reaction.

At Kansota Farms, near Albert Lea, Minnesota, there is a considerable area of highly productive peat, which, where deep, scabs badly in Cobblers and has to be planted to Russet Burbanks. As the peat becomes more shallow and the clay subsoil nearer the surface, there is less scab. There is no scab where the peat is extremely shallow.

Our experiences in the Red River Valley as well as our experiences with seed from this region of light rainfall have taught us that while, normally, the deeper heavier lands will produce no scab, yet some scab may be produced on medium heavy lands in dry years, and much scab on the lighter lands except in years of abundant rainfall at tuber setting time.

At the Northwest School of Agriculture at Crookston, Polk County, Minnesota, there is a lake shore alkali situation, which is rather interesting. The farm lies on one of the beaches of the ancient Lake Agassiz that has become the Red River "Valley." There is a high concentration of alkali, with pH values of 8.0 and above. The soil is gumbo and deep, but here in dry years, and especially in a series of dry years, scab is quite severe. In seasons of a reasonable amount of moisture, the cool and relatively air-excluding soil and subsoil promote conditions which result in a clean crop.

The acid peats and mucks of northern Minnesota and many of the same soils of the states from Wisconsin to New York grow clean potatoes. When these soils are heavily limed, scab develops at once.

In the San Luis Valley of Colorado, on the farm where the record yield of 1145.17 bushels per acre on 10 acres was secured in 1929, the pH is 8.0; and there is no scab. The reasons appear to be two: (1) the altitude is 7500 feet and therefore low temperatures prevail,

(2) the land is nearly flat and is subirrigated, and the water stands 3 to 4 feet down, assuring added coolness, much moisture and heavy leaf shade. Farther up the valley, with higher altitude, lower pH values and similar soil, but with row irrigation and deep drainage, there is much scab. On the deep friable mesa soils of only slightly lower altitude, but with row irrigation and much slope, so that the water runs low in the row and tuber beds remain dry, they can now produce only Russet Burbanks.

In the Greeley district of Colorado, where the crop is row irrigated on rather flat land before the tubers set and continuously thereafter, the tuber beds are never dry and scab is unknown. This is true even where the subsoil is gravel. It would not be true over gravel if the surface sloped enough to keep the irrigation water down low in the rows. Twenty-six pH tests of Greeley potato farms run from 6.50 to 8.15 and average 7.58. The soil temperatures also are high. The exclusion of air due to the high soil moisture content of the soil, would appear to be the important factor in limiting scab.

In the San Benito, Brownsville region in Texas, the production of Triumphs involves a serious scab problem which good seed disinfection has not solved.

In the years 1929, 1930 and 1931, in the vicinity of Los Fresnos, Tabenhaus, Bach and Alsmeyer conducted elaborate tests with sulphur for the control of scab. A series of 72 determinations of the pH of the soil of the plots, for each 6″ to 36″ ranged from 7.1 to 8.3 and averaged 7.7. These tests were unsuccessful since scab was not controlled. In February, 1935, a hole six feet deep was dug near the middle of the former plots, and the soil was found to range from a loose finely-grained, but gritty dark brown loam at the top, to well-packed but similar soil, which became lighter in color at approximately two feet. Lower than two feet, there were lime particles. From generous and well distributed samples of the subsoil, the clay was washed out under a faucet, and probably also much of the very fine sand but approximately 30 per cent by volume of very fine sand still remained. Evidently here in a highly alkaline and highly aerated soil, scab is serious because of the alkalinity and aeration.

In the delta of the Rio Grande, as in other nearly level areas, the resacas, in overflowing, deposited first the heavier gritty though very fine silt, leaving the lands close to the channel, high, well-drained and sandy; while the more easily borne finer particles were carried farther back, where they made heavier lower lying lands. Two master farmers, both potato growers, in the neighborhood of the former plots, stated that no trouble with scab was experienced on the heavier lands

farther from the resaca, but that the fine sand loams gave the larger yields. The heavier lands on the fringe of the potato district proper have no scab problem.

In eastern Oregon, they have combinations of dryness and alkalinity, and usually can grow no variety except Russet Burbanks, although irrigations at the right periods sometimes produce clean crops of other varieties.

In Oregon, west of the mountains, where there is more rain, more natural verdure, and many acid soils, scab is not a serious problem.

In many sections of Idaho, where conditions are similar to those of eastern Oregon, when scab has once been introduced in many of the looser soils and subsoils, the Russet Burbank is the only potato that can be produced. Scab comes first in the spots with poor subsoils.

In California, scab is not a major trouble. Sulphur has controlled the disease to a slight extent on sandy lands in the southern portion. High ground water levels under the peat lands of the Delta region seem to have controlled scab in that section. There are some places, however, where scab is severe on heavy soils in the Sacramento Valley. The disease occurs occasionally on the coastal sections. Rotation has been of but slight value, in any California area.

The foregoing observations on the geography of scab in the United States have led us to conclude that the following reasons may be given as the factors controlling the presence or absence of scab damage to the crop:

(1) The extent of the presence of the scab organism in the soil or on the seed.

(2) The possibility and the degree of infection on the tuber. (a) The variety. (b) Conditions in the early season.

(3) The degree of aeration. (a) Water in soil, as a displacer of air, or a hindrance to its entrance, (b) Textures of soil, (c) Nature of subsoil.

(4) Reaction of soil; (a) Lime and other alkalis present, (b) Acid production with ammonium sulphate and sulphur.

(5) Temperature of soil; (a) Air temperatures and sunshine, (b) Moisture in soil and subsoil, and the ground water level, as controllers of soil temperature.

SECTIONAL NOTES

CALIFORNIA

Seed potato certification has increased considerably during this past year. In 1934 we certified 166 acres and at the present time we still

have 362 acres eligible. The crops are good and no unusual defects are being encountered.

A preliminary estimate of yield by varieties, subject to correction, is as follows: Netted Gem 20,000 100 lb. bags; White Rose 15,000, British Queen 6,000, Burbank 2,500, Katahdin 100, and Bliss Triumph 50. (Oct. 16).—H. W. POULSEN.

INDIANA

Although final figures are not available at this time, it looks as if the production of potatoes in Indiana would be very close to five and a half million bushels. According to the 1935 census, there has been an increase in acreage during the past five years of approximately 24,000 acres in Indiana. A number of our counties are now producing more potatoes than they consume and in these counties we have found the average acre yield advancing quite rapidly, being well over 100 bushels to the acre. We have also found that good certified seed and sound cultural practices produce good yields of high quality potatoes. (Nov. 6).—W. B. WARD.

IDAHO

We were supposed to have something over 20,000,000 bushels of potatoes this year. Owing to lack of frost in the commercial growing districts, the vines did not ripen until late, so that digging was delayed past the usual time. The first real killing frost came during the latter part of October, and many growers did not begin harvesting until about the last week of the month. The first frost was followed within a comparatively short time by severe freezing and a snow storm in some districts. Low temperatures have continued until the present.

Some estimates place the amount frozen in the ground as high as 6,000 cars. I believe, however, that this is somewhat of an exaggeration, but we have had a very heavy loss. The temperature has not been above the freezing point for the past five or six days, and the mercury has been down to zero or below in many of the potato growing districts.

The quality of the Idaho potato this year is above the average. Taking into account the damage done during the growing season by vascular infection, which was more or less epidemic, and the frost that has now ruined all potatoes in the ground, I doubt if we will have over 16,000,000 or 17,000,000 bushels of potatoes that will be marketable.

I have not as yet checked up on our seed stocks that may be certified, but anticipate that there will be somewhat less than last year, or about 125,000 bushels.

Until the past ten days the market has been rather discouraging. At present, however, prices have risen so that our growers are receiving from $1.00 to $1.25 per 100 for U. S. No. 1 Netted Gems. (Nov. 6).—E. R. BENNETT.

IOWA

W. A. Hendrickson, Henry Wegman and Sam Kennedy have been nominated to the state committee for the enforcement of the potato control act. S. W. Edgecombe of Ames is to be the official adviser for both state and county committees. The present indications are that the growers will make a real effort to see that the provisions of the act are properly carried out. At a recent planning meeting held in Kansas City it was apparent that excellent progress is being made in Missouri, Kansas, Oklahoma and Arkansas.

Several new seedlings tested this year have shown up exceptionally well. The most promising seedling to date is 35-26, Krantz, cross of Ohio and Russet Rural, bred by him and developed in Iowa.—C. L. FITCH.

MAINE

The Maine Department of Agriculture reports that 20,165 acres of potatoes passed the field inspections as compared with 16,006 last year. The important point, however, is that, in spite of the increased acreage, there are not so many bushels of certified seed potatoes available for sale as last year. In 1934 there were 6,003,000 bushels and in 1935 there were only 5,873,000 bushels of which 80 per cent will grade for shipment. In addition to this, the type is inferior to last year's standard which in all probability will still decrease the amount available for shipment. As nearly as can be determinel the sale up to this time has not equalled that of a year ago when there was much early buying followed by a sharp decline. This year, however, it would seem that the buyers have committed a similar error by waiting. The certified seed market today is $2.75 to $3.00 per barrel for January-February shipment and growers are not anxious to sell.

The holdings of certified seed, by variety, are as follows: Green Mountains 2,271,000 bushels; Irish Cobblers 2,932,000; Spaulding Rose 335,000; and all Other Varieties 334,000. (Nov. 15).—E. L. NEDWICK.

MASSACHUSETTS

The marked advance in potato prices during past weeks was welcomed by growers. For those with storage facilities, the tendency during the rise has been to slow down on sales, awaiting the market.

Steps will be taken to effect allotment to growers for the Potato Control Act as soon as forms are available for Washington. (Nov. 14).—RALPH W. DONALDSON.

MINNESOTA

During the first week in October, extremely low temperatures prevailed and subsequent harvesting operations showed that considerable freezing damage occurred on the potatoes in these fields.

Potatoes are usually safe in the ground until about the fifteenth of October although a number of frosts generally occur previous to that date; these, however, do very little, if any, damage. Temperatures as low as 14° and 16° F. were reported from a number of places in the Red River Valley and the Arrowhead country. Similar reports from surrounding, and some of the far west states, have had a distinct reaction on proposed marketing agreements and have been responsible for a welcome increase in the price of potatoes.

On October 22, a potato meeting called by the AAA for the purpose of discussing the potato situation, the Warren Act, and the advisability of the northern states' entering into some sort of marketing agreement that would result in better prices to the growers was held at St. Paul. Wisconsin, South Dakota, North Dakota, and Minnesota were represented at the meeting. Action by all of these states was taken to hold hearings for the purpose of devising a marketing agreement that would be satisfactory to the growers of the states involved, in fact, one which might be applicable to all the surplus producing states.

By the time the hearing called for St. Paul on November 6 was held, the extent of the freezing damage was realized, and as a result it was deemed unwise to proceed with any further plans for a marketing agreement covering the 1935 crop. (Nov. 14).—A. G. TOLAAS.

MONTANA

Our total crop this year is estimated at approximately two and one-quarter million bushels, and probably it will not be far from 2,300,000 bushels. Our certified acreage shows a slight increase both in total acreage and in number of growers. Our acreage, by varieties, that passed field inspection is as follows: Bliss Triumph, 281⅓ acres with a total yield of 53,595 bushels; Netted Gem, total acreage of 235¾ acres with a total yield of 35,897 bushels; White Rose 110 acres, total yield of 22,880 bushels; Katahdin 13 acres, total yield

3,900 bushels; Irish Cobblers 23¼ acres, total yield of 3,800 bushels. Our increase in acreage was made in the White Rose and Bliss Triumph varieties. This is partly due to the increased demand for the latter varieties a year ago.

A few growers have voiced their objections to the potato control act but, to a great extent, the larger growers are in favor of it. (Nov. 7).—E. E. Isaac.

NEBRASKA

The crop conditions in this state have changed very little this past month. Practically all the potatoes were dug and in the cellars before cold weather arrived during the latter part of October. A very few potatoes were stored in temporary outdoor pits. There is only a very small amount of frost in these pits. The yields of potatoes were, in most cases, better than the growers had been expecting, and the quality was better than usual. The percentage of scab and fusarium infection is very much less than usual. As the latter part of the summer was very dry there has been no trouble with tuber infection from alternaria.

It is rather hazardous to venture an opinion concerning the view of the growers with regard to the Federal Legislation. At several meetings held recently in western Nebraska probably most of the growers were inclined to favor giving the Warren plan an opportunity, feeling that it might help the situation. It seems, however, that the interest in this proposition diminished somewhat when the price of potatoes started to rise, after the extent of the freezing damage in the north became known.

The plan for a marketing agreement among the states of Nebraska, Wyoming, Colorado and Idaho presents a number of difficulties because of the great diversity of conditions and varieties in the different parts of these states. Because of the great distance between various producing areas in this region, it is quite evident that the administration of such a marketing agreement will be very difficult. There was quite a general feeling that the pro-rating of shipments would be extremely difficult and would make the whole proposition so cumbersome that it could not be worked effectively. This one aspect of the plan drew more opposition than anything else. There seemed to be a fairly general agreement among both dealers and growers that the same end could be accomplished by the use of grade restrictions, providing that potatoes below 1⅞ inches would be permitted. The latter provision is considered necessary because of the large business of Triumph seed

potatoes in Wyoming and western Nebraska. (Nov. 14).—H. O. WERNER.

NEW YORK

The October 1st potato estimate for New York was 23,000,000 bushels, a reduction of 2,000,000 bushels from the September estimate and nearly 30 per cent below the big crop of 1934. This year's estimate for New York is likely to be still further reduced in the November report when it is more definitely known how much loss resulted from blight rot and from the low temperature which occurred in late October. In Steuben County many fields were affected by the cold weather before harvest. A few fields were entirely abandoned because of blight rot. Many growers in Western New York report a yield which does not exceed one-half that of 1934 and, in general, yields are even less than expected before harvesting.

The result of these low yields has led most growers to hold in storage the soundest part of their crop for prospective higher prices. Only the inferior stock is being marketed at this time. Prices have advanced rather steadily until, at this date, growers are getting 50 cents a bushel at the farm and at loading points in Western New York. Growers of certified seed are not even quoting prices as they have agreed to wait until the middle of November to decide what the demand and price for seed is likely to be. Failure to meet the certification standard this year has resulted in approximately half as much certified seed in New York as last year.

The A.A.A. Control Marketing Plan for 1936 is not meeting with as much opposition as it did when less was known about its administration and plan. An advisory committee, charged with the educational work necessary as an aid in carrying out the plan, has been named by the Director of Extension. The committee consists of H. C. Thompson, E. V. Hardenburg, M. P. Rasmussen, F. A. Harper and E. A. Flansburgh, Chairman. (Nov. 9).—E. V. HARDENBURG.

NORTH CAROLINA

A total of 318 acres of seed potatoes was entered for certification this year. Of these, 168 acres were certified. The acreage certified was distributed, by varieties, as follows: Irish Cobbler, 143 acres; Green Mountainn, 29 acres and Katahdin, 2 acres. Yield records are not yet available but the yields are estimated from 100 to 125 bushels an acre. (Oct. 31).—G. K. MIDDLETON.

NORTH DAKOTA

Most of North Dakota's potato crop was dug this fall before the field frosts. This is more particularly true of our certified seed potatoes than of the table stock. Our total certified seed potato crop will therefore not exceed 1,000,000 bushels this year. The amount of field frost which prevailed in our common potatoes will not be a factor during the rest of the season, since most of these potatoes were quickly moved to market.

Federal Government officials held an official hearing at Grand Forks on November 4, to discuss the question of a proposed marketing agreement to regulate the handling of low grade potatoes in this area during this season. In a general way our growers favored such an agreement, hence they asked for the official hearing. Between the time of this request and the date of the hearing, we accumulated information to the effect that there is not likely to be a dangerous surplus of late-crop potatoes this year. On the basis of this tentative conclusion our growers decided that there would be no necessity for curtailment in the handling of any of our potatoes, and that the expense of such a program under those circumstances would be unwarranted, since the cost was to be assessed against the growers.

In any event, our North Dakota growers proclaimed that they were unwilling to enter into any agreement or plan for regulation of the handling of low grade potatoes in the late-crop state, unless all states from Maine to Oregon and Washington would be required to participate in the program. Our North Dakota growers have expressed this sentiment on every occasion of a public hearing on potato programs, both locally and in Washington. This week we received a wire from the A.A.A. informing us that the State of Maine had finally requested the Government to draft a marketing agreement for them to regulate the handling of the lower grades of potatoes. Our growers have felt that it would be useless for some of the states to bind themselves in a curtailment program, when Maine, which represents the biggest factor in the potato deal, would be left out of it. (Nov. 14).—E. M. GILLIG.

PENNSYLVANIA

In recent weeks there has been marked activity in demand for potatoes, especially on the part of independent truckers who are looking for crops which can be picked up at low prices regardless of grading or quality. This has been accompanied by a strong tendency for growers to hold their good quality potatoes until their ideas as to price are met.

Quality in general is good except for some blight rot and frost injury in the north and at high altitudes. With the exception of the potatoes in the mountainous regions, the crop was well matured before being placed in storage. The crop was also stored during dry weather which means very little dirt or storage troubles.

A group of potato growers in Somerset County have set up a grader and cleaner and are prepared to grade, pack and sell any farmer's potatoes on a basis of cost of sacks, labor and overhead. They are attempting to produce a genuinely satisfactory grade and have a market for all they can handle through chain stores in Johnstown and nearby, at prices comparable to Maine stock. One of the principal objects of this group is to show what good grading and packing will do to improve the reputation and raise the price level of Pennsylvania potatoes. (Nov. 8).—J. B. R. DICKEY.

RHODE ISLAND

The crop turned out very satisfactorily in general; several large growers reporting yields of 350 to 375 bushels per acre. The acreage for the state was probably a little larger than last year. The growers are receiving approximately $1.85 per hundred at present. Our growers are generally opposed to potato control program. (Nov. 14).—T. E. ODLAND.

SOUTH DAKOTA

The potato harvest was completed about a month ago. The crop in our main potato growing sections in the eastern part of the state was quite good with average yields from approximately 125 to 150 bushels per acre among our better growers. The quality of the crop is generally good although the tubers in some fields are misshapen due to the dry weather in August. The crop, however, is relatively free from disease. (Nov. 13.—K. H. KLAGES.

VERMONT

Vermont's allotment of 1,999,000 bushels under the Potato Act of 1935 appears to have been satisfactory to growers who have studied the situation. So much of the state's acreage is in the small fields grown primarily for home use that the placing of the tax-free allotment at only a little over half the average production should not seriously affect the growers' operations.

Very few quantity sales of certified seed potatoes have been reported to date. This is probably due in part to the unevenness of the market. In some localities the price of potatoes for table stock has been attractively high. Many farmers who ordinarily raise their own crop have found their fields too badly rotted to dig and have paid general market price plus transportation cost for their home supply from neighbors who have sprayed. Some seed has been sold through these channels.

Some negotiations have been made, through the Division of Markets of the State Department of Agriculture, toward a pool sales setup with the A. & P. Chain system. The plan would follow rather closely that of the New Hampshire growers who sell to the First National Stores. It appears doubtful if anything will materialize along this line before another season, however. (Nov. 14).—H. L. Bailey.

WASHINGTON

We are not entirely sure of the total loss of the potato crop because of the recent low temperatures but we are certain that it is considerable. Approximately 20 per cent of our certified seed potatoes were still in the ground and approximately 25 per cent of the commercial potatoes likewise were not dug. A considerable amount, if not all, of the potatoes in the ground at the beginning of the cold period will be a total loss.

At the present moment the price of commercial potatoes ranges approximately $40.00 per ton with very few sales being consummated. Buyers are waiting to determine the total damage to the crop in the Northwest before actively purchasing. Commercial stocks in storage are practically depleted and purchases are being made on a hand-to-mouth basis.

There is considerable discussion concerning the potato control act with apparently the majority of our large potato growers favoring the act. Administrative officials are somewhat worried as to the possible outcome of attempting to enforce the act as it now stands. (Nov. 12). —Charles D. Gaines.

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BETTER QUALITY AND MARKETING METHODS NECESSARY

Because of improved prices for potatoes, many growers are more optimistic concerning the situation in the industry. It must be borne in mind that, in previous years, this feeling of optimism usually resulted in an increase in acreage and low prices the following year. Fortunately, if the provisions of the potato control plan are carried out, this tendency to over plant will be checked.

We cannot, however, depend entirely on acreage reduction to solve all of our difficulties. The total production this year was probably little in excess of 350,000,000 bushels. The sales quota for next year, as proclaimed by the Secretary of Agriculture, is approximately equal in total production to this year's crop. In the past, a crop of this size very often resulted in low prices.

It is very questionable if the Control Act alone will accomplish all that is expected of it. In view of this fact it is important that the grower contribute his share toward improving the industry. It is necessary, for example, that more attention be given to the question of grading. Far too many off-grade potatoes are shipped to the market. If these were kept at home, to be used for livestock feeding or other purposes, there is little doubt that the remainder of the crop would bring a better price.

With a better graded product the next important step is to see that it is marketed in a manner that will insure maximum returns to the producer. More attention must be given to marketing methods as well as to the agencies handling the crop. It is probably true that the individual grower can do but little in the way of correcting this situation so that this question must be given intelligent study by growers' organizations and others interested in the potato crop. The proper adjustment of this perplexing question would do much to ensure better returns to the grower.